

NMP2-LA-2008-211624

MESSIB

Multi-source Energy Storage System Integrated in Buildings

4.4.0.5 Resource efficient and clean buildings (Theme 4.NMP)



Multi-source Energy Storage System
Integrated in Buildings



www.messib.eu

MESSIB PARTNERS

Participant n°	Participant organisation name	Organization Type	Country
1 (Coordinator)	ACCIONA	Large industrial	Spain
2	AIDICO	Private research centre	Spain
3	BASF	Large industrial	Germany
4	CCS	SME association	Slovenia
6	CNR-ISAC	Public research centre	Italy
7	CSTB	Public research centre	France
8	ECN	Private research centre	Netherlands
9	FRAUNHOFER	Private research centre	Germany
10	GESTA	Large industrial	Italy
11	KNAUFKG	Large industrial	Germany
12	MOSTOSTAL	Large industrial	Poland
13	NTUA.HMCS	Higher education establishment	Greece
14	ROBOTINA	SME industrial	Slovenia

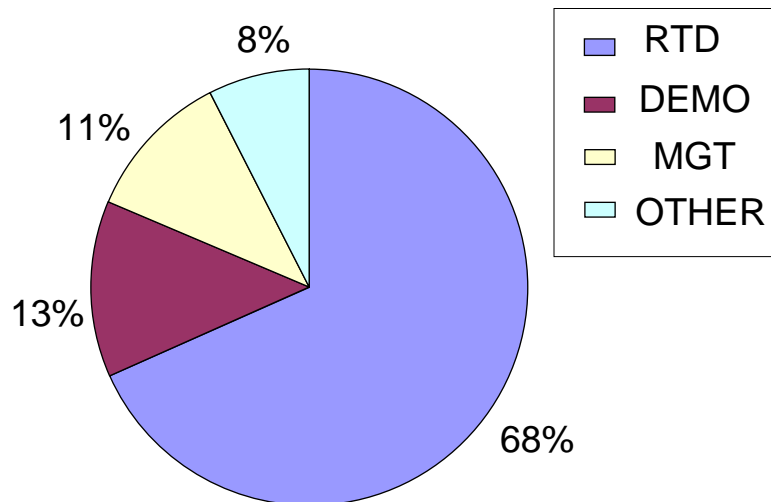
MESSIB PARTNERS

Participant n°	Participant organisation name	Organization Type	Country
15	SRIBS	Private research centre	China
16	TECNALIA-LABEIN	Private research centre	Spain
17	UPONOR	Large industrial	Finland
18	USTUTT	Higher education establishment	Germany
19	VTT	Private research centre	Finland
20	WANSDRONK	SME architect	Netherlands
21	ZIGOR	SME industrial	Spain
22	D'APPOLONIA	Large industrial	Italy
23	TEKNIKER	Private research centre	Spain
24	KNAUF ABEE	Large industrial	Greece

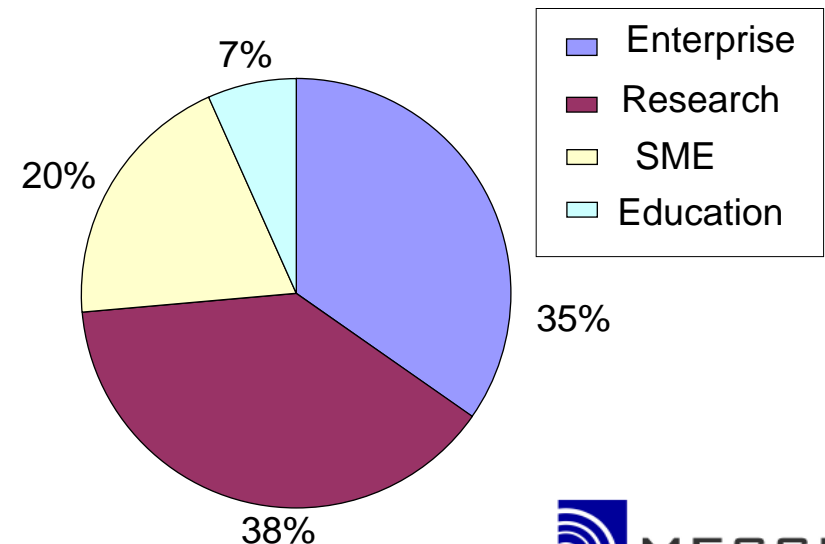
MESSIB OVERVIEW

- Total budget – 8.836.492€
- Total funding – 5.996.005€
- Large-scale integrating collaborative projects
- 22 official partners from 9 countries – 1 interested organization from China
- Project Lifetime: 4 years. (Starting date: January 2009)
- Project URL: www.messib.eu

Budget distribution per type of activity



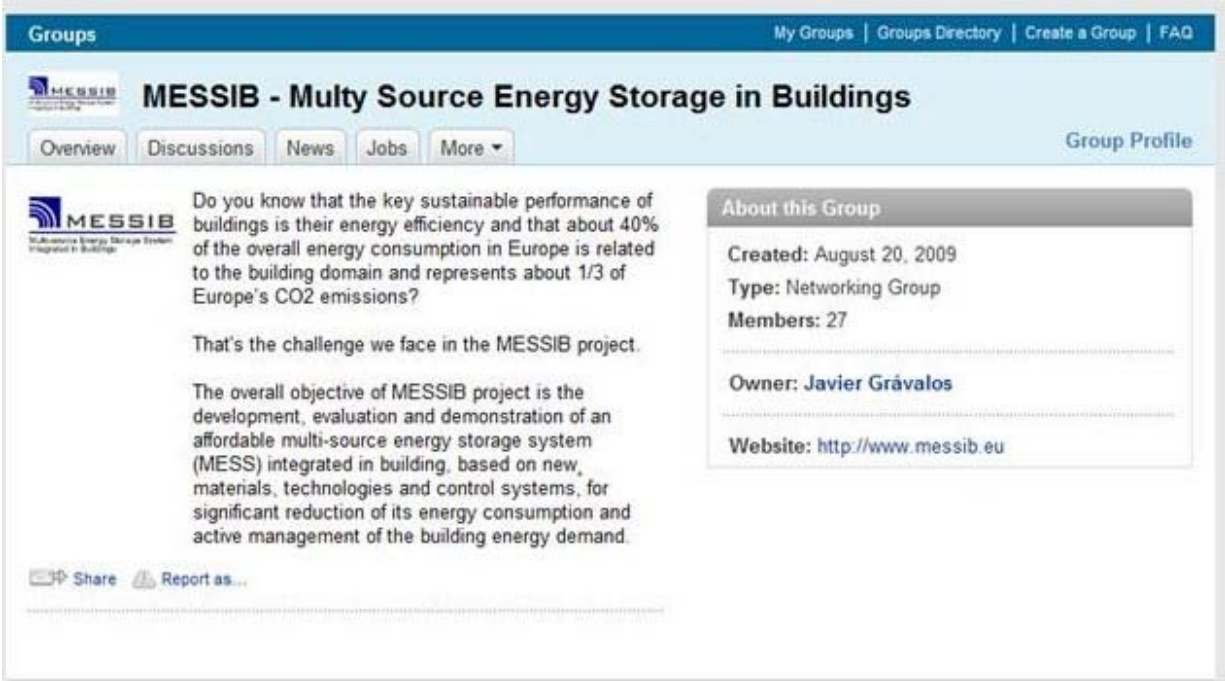
Budget distribution per type of partner



MESSIB OVERVIEW

- Project URL: www.messib.eu
- From July Messib website has near a thousand of visits all over the world.
- Messib has opened a professional network group in **LinkedIn**®.

Messib results have been disseminated in 4 big congress events during 2009 and some press note by the consortium partners



The screenshot shows the LinkedIn group page for "MESSIB - Multi Source Energy Storage in Buildings". The page header includes navigation links: "My Groups", "Groups Directory", "Create a Group", and "FAQ". The group name is prominently displayed, along with a "Group Profile" link. Below the name are tabs for "Overview", "Discussions", "News", "Jobs", and "More". The main content area features the MESSIB logo and a text block that reads: "Do you know that the key sustainable performance of buildings is their energy efficiency and that about 40% of the overall energy consumption in Europe is related to the building domain and represents about 1/3 of Europe's CO2 emissions? That's the challenge we face in the MESSIB project. The overall objective of MESSIB project is the development, evaluation and demonstration of an affordable multi-source energy storage system (MESS) integrated in building, based on new, materials, technologies and control systems, for significant reduction of its energy consumption and active management of the building energy demand." To the right, an "About this Group" box provides details: "Created: August 20, 2009", "Type: Networking Group", "Members: 27", "Owner: Javier Grávalos", and "Website: http://www.messib.eu". At the bottom of the main content area, there are "Share" and "Report as..." options.

MESSIB OVERVIEW

- This project comes to answer the EU need in the Directive on the energy performance of buildings (EPBD)
- Energy efficiency and integration of RES is a priority within energy policy because of its potential contribution to meeting energy security objectives and meeting Kyoto Protocol targets.
- Buildings in Europe account more than 36% of the energy use. 43% of the energy consumption in building is used for heating and cooling.
- **MESSIB will contribute to strengthen the competitiveness of both, the European Building and Energy sectors in key energy efficient technologies.**

CONCEPT AND OBJECTIVES

Overall Objective

Objective

Reduce energy consumption by introducing a new energy storage capacity in buildings

MESS is composed by two thermal and two electrical storage systems, integrated with the building installations and a control system to manage the building energy demand

To develop, evaluate and demonstrate an integrated multi-source **energy storage system** able to significantly reduce the energy consumption, manage smartly the electrical energy required, improve the indoor environment and the quality and security of energy supply at building and district level.

CONCEPT AND OBJECTIVES

Overall Objective

- The new concept is based on a combination of:

1) Thermal and electrical energy storage systems

- Radical improvement of **thermal energy storage** capability for reducing energy consumption and improving indoor comfort:
 - By developing a new Phase Change System based on new materials and improved components in building envelope, internal walls and ceilings.
 - By applying the most efficient ground storage technologies.
- Drastic improvement of **electrical energy storage** to improve the quality and reliability of energy supply by developing and applying electrical energy storage technologies for reducing “electrical energy consumption cost”
 - New lightweight and high strength composite flywheels for buildings.
 - More durable Vanadium-Redox Flow Batteries.

2) Short and long term storage.

- Short Storage (during a day): by means of the PCMs and Flywheel
- Long Storage (seasonal): ground storage and vanadium-Redox flow batteries.

- Demonstration: the system will be installed, monitored and evaluated in a:
 - New residential building
 - Existing one
 - Cultural Heritage Building
 - Extended at district level



I-SSB house in Greece



Solar House in Germany

CONCEPT AND OBJECTIVES

Scientific and Technical Objectives

- Develop adapted **simulation tools** for each system, and an integrated one.
- **To Integrate the Multi-source Storage System itself and with conventional installations.**
- To develop an individual control system for each energy storage technology and an **integrated control system** for the Multi-source Energy Storage System.
- To **demonstrate** the above technologies and systems in a new building in north climate and in an existing residential one in south climate
- To adapt the developed technologies, integration with conventional installations and control systems to **Cultural Heritage applications.**
- To extend the above technologies and control systems at district level.
- To contribute to standardisation through pre-normative research.
- To train different stakeholders.
- To develop customized business models for Energy Storage services.

CONCEPT AND OBJECTIVES

Scientific and Technical Objectives

Knowledge and technologies generated will:

- **Reduce the energy demand** of buildings from the grid
- **Reduce the total energy costs** by shifting energy from where and when it is not needed to moments and regions of the building where it can be of most value.
- Reduce the energy peaks creating a non saturated grid reducing the overload times which will **increase the security and efficiency of the network.**
- **Reduce emissions** with renewable sources, storing renewable energy during low load times and allowing storage of 'Off-grid' PV & Wind energy.

S/T METHODOLOGY AND ASSOCIATED WORK PLAN

- **WP0. Project management**

Deals with the co-ordination and management of the project. It will be focused on: creating the necessary governance structure for an effective project direction and management, performing the financial, legal, administrative and technical co-ordination, establishing the communication flow and methods and promoting the gender equality in the project.

- **WP1. Meeting costumers and value chain requirements, driving forces and trends**

Deals with Meeting customer and value chain requirements, driving forces, barriers and trends analysing and evaluating the project environment considering all aspects of customers and value chain requirements as well as the driving forces and barriers which help or impede the implementation of the project results. Trends will be also analysed considering different scenarios and forecasting tools

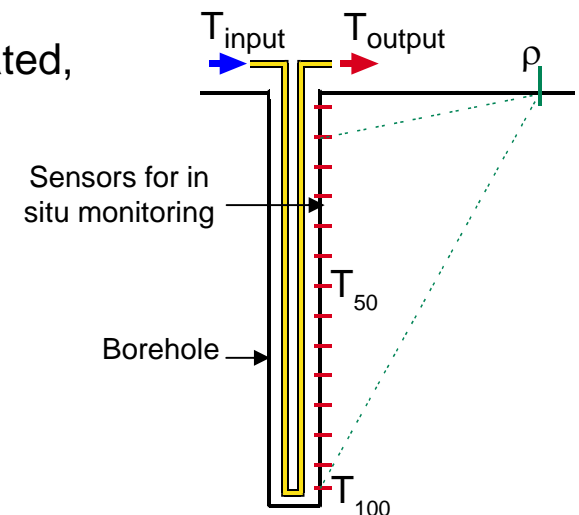
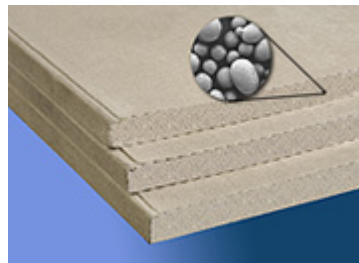
S/T METHODOLOGY AND ASSOCIATED WORK PLAN

■ WP2. Thermal Energy Storage Technologies for buildings: PCMs and ground storage

A new thermal Energy storage System based on PCMs and ground storage will be designed, manufactured and tested. Suitable PCMs and microencapsulations as well as Fluid (slurry) containing microencapsulated PCMs will be developed and incorporated into buildings envelope, floor, ceiling and wall system. A simulation software tool will be developed for system design.

In parallel, an innovative thermal ground storage system based in new lower cost tube materials with improved thermal and corrosion proof properties and soil additives to improve ground heat capacity, will be developed.

Both thermal energy storage subsystems will be demonstrated, monitored and evaluated in **WP6**.



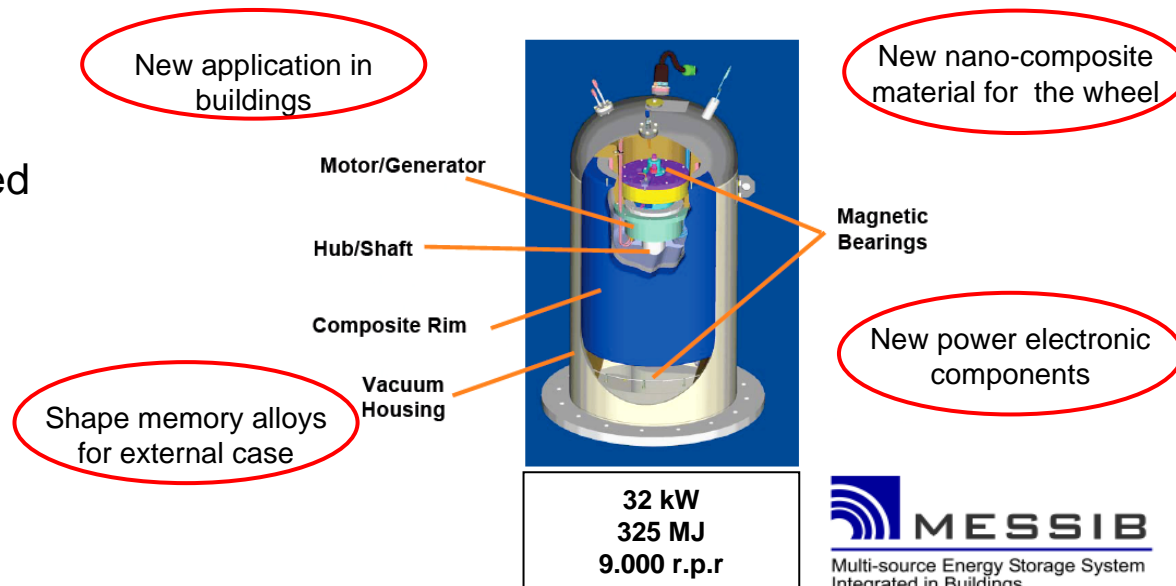
S/T METHODOLOGY AND ASSOCIATED WORK PLAN

■ WP3. Electrical Energy Storage Technologies for buildings: Flywheels and Batteries

An electrical Energy storage systems for buildings composed by Flywheels and Vanadium-Redox Flow Batteries will be developed and tested.

1) The Flywheel concept will be studied for buildings; 2) New high strength and light weight composite material for bigger quantity of energy storage will be developed together with a new power electronic system and high efficiency motor/generator and a low loss magnetic bearing; 3) Advanced materials for sealing batteries tanks and vanadium stability improvement for advanced Vanadium-Redox Flow Batteries in Buildings for electrical storage.

Both electrical energy storage subsystems will be demonstrated in **WP6**.



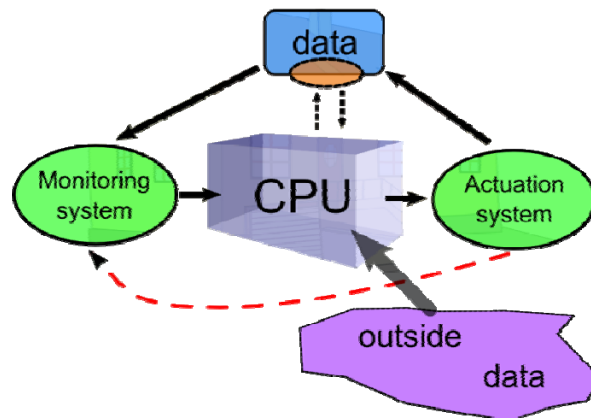
S/T METHODOLOGY AND ASSOCIATED WORK PLAN

- **WP4. Integration of the Multi-source Storage Technologies with conventional installations**

The Multi-source storage system will be integrated with conventional installations as HVAC system and electrical and lighting grid. It will be demonstrated, monitored and evaluated in **WP6**.

- **WP5. Smart energy management system**

Individual control systems for each energy storage technology (PCM, Ground Storage, Flywheel and Vanadium-Redox Flow Batteries in Buildings) and an integrated control system for the multi-source system will be developed. For that purpose a multilevel automation and communication architecture for monitoring and multi-source energy storage system will be developed. Demonstration in **WP6**.



S/T METHODOLOGY AND ASSOCIATED WORK PLAN

- **WP6. Demonstration in a new residential and in an existing office building**

WP6 will be dedicated to demonstration activities. In WP6 a new residential building and an existing building will be used as case studies. All systems will be monitored during a year and the results will be evaluated.



An existing office building in Germany (Fraunhofer ISE), in the Solar House in Freiburg, specially equipped with RES (central European climate).



A new residential in Greece (Mediterranean climatic conditions), that it is built within the running I-SSB FP6 IP

Both buildings will be fully equipped with sensors for monitoring through a wireless network.

S/T METHODOLOGY AND ASSOCIATED WORK PLAN

- **WP7. Extension of the Multisource Energy Storage and Smart energy management system to a district level**

A feasibility study for the extension of the above technologies and control systems at larger scale: district level, will be carried out.

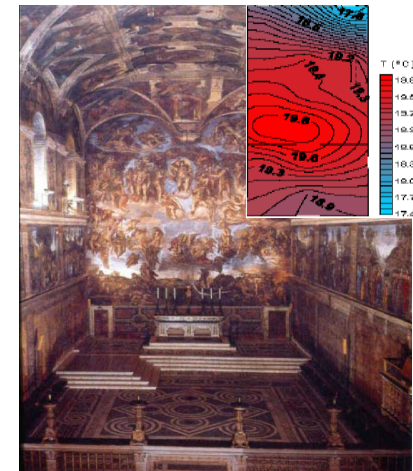
The impact of its implementation will be assessed.



- **WP8. Adaptation of the developed technologies to Cultural Heritage applications**

The developed technologies and control systems will be adapted to Cultural Heritage Applications. It will imply to adapt them to narrow spaces and difficult work conditions by low intrusive implementation processes.

Thermal Energy storage application based on PCMs by vacuum technologies and Low intrusive Electrical Energy storage application will be considered.



S/T METHODOLOGY AND ASSOCIATED WORK PLAN

■ **WP9. Pre-normative research**

Pre normative research will be carried out in **WP9**. Analysis of current pre-normative related initiatives will be carried out and practices for Standardisation & Testing and Certification procedures for the technologies will be recommended.

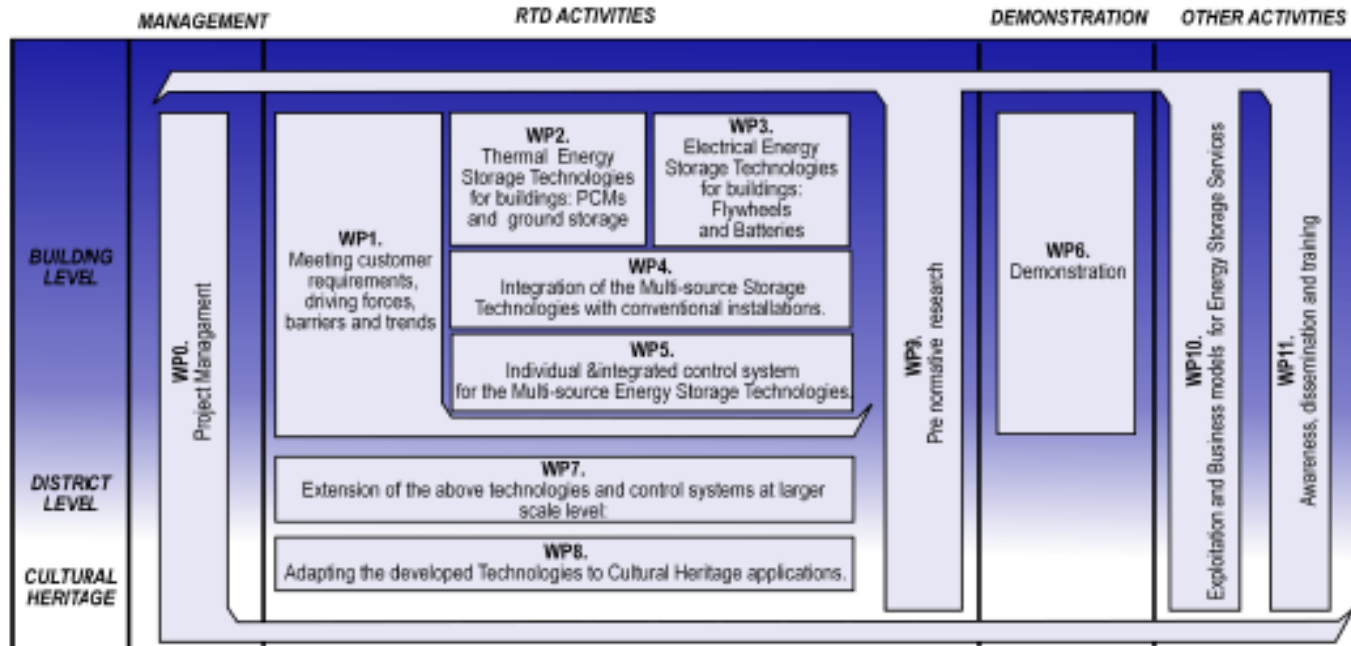
■ **WP10. Exploitation and Business models for Energy Storage Services**

Business models for Energy Storage customized services will be developed. Building/district energy demand profile as well as customer comfort requirements will be analysed and evaluated. Services regarding predictive maintenance through performance data monitoring will be created. Services based on mechanical, electrical, electronic and control systems maintenance will be also developed.

■ **WP11. Awareness, dissemination, networking and training**

Awareness, dissemination, training and exploitation activities will be carried out. Training courses in the application of the technologies will be prepared and deployed specially to SMEs. An exploitation plan will also be done including deliverables and routes for exploitation as well as targeted partners and economic impact for the consortium and Europe.

WORKING PLAN

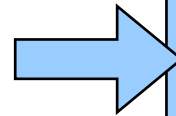


WP	1 st Year				2 nd Year				3 rd Year				4 th Year			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
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EXPECTED IMPACT

In a conventional residential building with conventional technologies, the consumption is:

- heat 200 kWh/m²/yr,
- electricity 30 kWh/m²/yr
- air conditioning 50 kWh/m²/yr,



end user energy cost
30.21 €/m²/yr
(EU-25 prices: 0.1416 €/kWh and
gas for heating 0.0944 €/kWh)

With MESSIB implementation in the market a 25% reduction in energy demand will be achieved; the cost of the electricity will be reduced at least 40%. With this assumptions the calculated cost of the energy beyond MESSIB will be **19.26 €/m²/yr**.

THANK YOU VERY MUCH FOR YOUR ATTENTION



Acciona Infraestructuras, S.A., Spain



AIDICO, Instituto Tecnológico de la Construcción, Spain



BASF SE, Germany



Slovenski gradbeni grozd - GIZ (Construction Cluster of Slovenia), Slovenia



Consiglio Nazionale delle Ricerche (CNR) - Istituto di Scienze dell'Atmosfera e del Clima (ISAC), Italy



Centre Scientifique et Technique du Batiment, France



Energy Research Centre of the Netherlands (ECN), Netherlands



Fraunhofer - Institut für Solare Energiesysteme ISE, Germany
Fraunhofer - Institut für Silicidforschung ISC, Germany



GESTA Spa - GLOBAL SERVICE MAKERS, Italy



Knauf Gips KG, Germany



Mostostal Warszawa S.A., Poland



NATIONAL TECHNICAL UNIVERSITY OF ATHENS, Greece



Robotina, podjetje za inženiring, marketing, trgovino in proizvodnjo d.o.o., Slovenia



FUNDACION LABEIN, Spain



Uponor Oyj, Finland



Universität Stuttgart, Lehrstuhl für Bauphysik, Abt. Ganzheitliche Bilanzierung (GaBi), Germany



VTT, Finland



Wansdrong Architektur, Netherlands



ZIGOR CORPORACIÓN, S.A., Spain



D'Appolonia S.P.A., Italy



Fundación Tekniker, Spain



Knauf Gypsopiia A.B.E.E., Greece



ulti-source Energy Storage System
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MESSIB

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4.4.0.5 Resource efficient and clean buildings (Theme 4.NMP)

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Multi-source Energy Storage System
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